

इंटरनेट

मानक

Disclosure to Promote the Right To Information

Whereas the Parliament of India has set out to provide a practical regime of right to information for citizens to secure access to information under the control of public authorities, in order to promote transparency and accountability in the working of every public authority, and whereas the attached publication of the Bureau of Indian Standards is of particular interest to the public, particularly disadvantaged communities and those engaged in the pursuit of education and knowledge, the attached public safety standard is made available to promote the timely dissemination of this information in an accurate manner to the public.

“जानने का अधिकार, जीने का अधिकार”

Mazdoor Kisan Shakti Sangathan

“The Right to Information, The Right to Live”

“पुराने को छोड़ नये के तरफ”

Jawaharlal Nehru

“Step Out From the Old to the New”

IS 12857 (1989): General Principles for the Creation of Graphical Symbols for Use on Equipment [LITD 8: Electronic Measuring Instruments, Systems and Accessories]



“ज्ञान से एक नये भारत का निर्माण”

Satyanarayan Gangaram Pitroda

“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

BLANK PAGE



Indian Standard

**GENERAL PRINCIPLES FOR THE CREATION
OF GRAPHICAL SYMBOLS FOR USE
ON EQUIPMENT**

भारतीय मानक
उपकरणों में उपयोग के लिये ग्राफीय प्रतीकों
के लिये सामान्य सिद्धान्त

UDC 621.38.038 : 003.62

© BIS 1990

BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BHADUR SHAH ZAFAR MARG
NEW DELHI 110002

June 1990

Price Group 6

Indian Standard

GENERAL PRINCIPLES FOR THE CREATION OF GRAPHICAL SYMBOLS FOR USE ON EQUIPMENT

NATIONAL FOREWORD

This Indian Standard, which is identical with IEC Pub 416 (1988) 'General principles for the creation of graphical symbols for use on equipment' issued by the International Electrotechnical Commission (IEC), was adopted by the Bureau of Indian Standards on 31 July 1989 on the recommendation of the Basic Standards on Electronics and Telecommunication Sectional Committee (LTD 1) and approval of the Electronics and Telecommunication Division Council.

In the adopted standard certain terminology and conventions are not identical with those used in Indian Standards; attention is especially drawn to the following:

- a) Comma (,) has been used as decimal marker while in Indian Standards the current practice is to use a point (.) as the decimal marker.
- b) Wherever the words 'International Standard' appear, referring to this standard, they should be read as 'Indian Standard'.
- c) For the purpose of this Indian Standard, only the metric dimensions are applicable.

CROSS REFERENCE

<i>International Standard</i>	<i>Indian Standard</i>	<i>Degree of Correspondence</i>
IEC Pub 27 (Part 1) Letter symbols to be used in electrical Technology Part 1 : General	IS 3722 Letter symbols and signs used in electrical technology Part 1 : 1983 General guidance on symbols and subscripts Part 2 : 1983 Reference tables for symbols and subscripts	Technically equivalent
IEC Pub 417 (1973) Graphical Symbols for use on equipment: Index, survey and compilation of the single sheets	IS 12856 (Part 1/Sec 1 to 4): 1989 Graphical symbols for use on equipment : Part 1 Index and survey IS 12856 (Part 2/Sec 1 to 9): 1989 Graphical symbols for use on equipment : Part 2 Compilation of single sheets	Identical
IEC 617 (Parts 1-4) Graphical symbols for diagrams	IS 12032 (Part 1 to Part 4) Graphical symbols for diagrams in the field of electrotechnology	Technically equivalent (all parts)
IEC 617 (Parts 6-8) Graphical symbols for diagram	IS 12032 (Part 6 to Part 8) Graphical symbols for diagrams in the field of electrotechnology	Technically equivalent (all parts)
IEC 617 (Parts 11) Graphical symbols for diagrams	IS 12032 (Part 11) Graphical symbols for diagrams in the field of electrotechnology	Technically equivalent

<i>International Standard</i>	<i>Indian Standard</i>	<i>Degree of Correspondence</i>
ISO 31 (Parts 0 to 13) Quantities, units and symbols	IS 1890 (Part 0 to Part 13): 1982 and 1983 Quantities, units and symbols	Identical (all parts)
ISO 3864 : 1984 Safety colours and safety signs	IS 9457 : 1980 Code of practice for safety colours and safety signs	Technically equivalent

The Basic Standards on Electronics and Telecommunication Sectional Committee has reviewed the provisions of following ISO and IEC standards and has decided that these are acceptable for use in conjunction with this standard :

- IEC Pub 27 (Parts 2 to 4) Letter symbols used in electrical technology
- IEC Pub 617 (Part 5) Graphical symbols for diagrams: Semiconductors and electron tubes
- IEC Pub 617 (Parts 9 and 10) Graphical symbols for diagrams
- IEC Pub 617 (Parts 12 and 13) Graphical symbols for diagrams
- ISO 3461-1 : 1988 General principles for the creation of graphical symbols — Part 1 : Graphical symbols for use on equipment
- ISO 3461-2 : 1987 General principles for the creation of graphical symbols — Part 2 : Graphical symbols for use in technical product documentation
- ISO 4196 : 1984 Graphical symbols — Use of arrows
- ISO 7000 : 1984 Graphical symbols for use on equipment — Index and synopsis
- ISO 7001 : 1980 Public information symbols
- ISO/TR 7239 : 1984 Development and principles for application of public information symbols

Only the English language text in the International Standard has been retained while adopting it in this Indian Standard.

1 Scope

This standard specifies the basis for the creation of graphical symbols for use on equipment. It contains rules for designing symbols, including their shape and size, and instructions for their application.

Graphical symbols for use on equipment may be employed

- to identify the equipment or a part of the equipment (e.g. a control or display);
- to indicate functional states (e.g. on, off, alarm);
- to designate connections (e.g. terminals, filling points);
- to provide information on packaging (e.g. identification of content, instructions for handling);
- to provide instructions for the operation of the equipment (e.g. warnings, limitations of use).

This standard does not apply to graphical symbols primarily intended for

- use on drawings;
- use in technical product documentation;
- public information.

However, graphical symbols initially developed for such purposes (see IEC 617, ISO 3461-2, ISO 7001 and ISO/TR 7239) may be used on equipment, provided that they are drawn in accordance with the principles laid down in this standard.

2 References

IEC 27 (parts 1 to 4), *Letter symbols to be used in electrical technology*.

IEC 417 : 1973, *Graphical symbols for use on equipment — Index, survey and compilation of the single sheets*.

IEC 617 (parts 1 to 13), *Graphical symbols for diagrams*.

ISO 31 (parts 0 to 13), *Quantities, units and symbols*.

ISO 3461-1 : 1988, *General principles for the creation of graphical symbols — Part 1 : Graphical symbols for use on equipment.*

ISO 3461-2 : 1987, *Part 2 : Graphical symbols for use in technical product documentation.*

ISO 3864 : 1984, *Safety colours and safety signs.*

ISO 4196 : 1984, *Graphical symbols — Use of arrows.*

ISO 7000 : 1984, *Graphical symbols for use on equipment — Index and synopsis.*

ISO 7001 : 1980, *Public information symbols.*

ISO/TR 7239 : 1984, *Development and principles for application of public information symbols.*

3 Definitions

For the purposes of this standard, the following definitions apply.

3.1 graphical symbol : Visually perceptible figure used to transmit information independently of language. It may be produced by drawing, printing or other means.

Note. — Internationally standardized letter symbols according to ISO 31 and IEC 27 may be considered to be graphical symbols.

3.2 graphical symbol elements : Parts of a graphical symbol.

Note 1. — A graphical symbol element with a specific meaning may be used to provide a common concept in the construction of a symbol family.

Note 2. — Letters, numerals, punctuation marks and mathematical symbols may be used as graphical symbol elements.

3.3 (symbol) original : Design of a graphical symbol, prepared in accordance with this standard, used for reference or reproduction purposes.

4 Meaning

The meaning assigned to each graphical symbol is expressed by its title which may be supplemented by an application note. The meaning shall be unambiguous and independent of terms related to a special technique or discipline.

The meaning of a graphical symbol may depend on its orientation and care shall be taken to avoid ambiguity (see 8.2).

5 Combination of graphical symbols

To represent certain concepts, graphical symbols or graphical symbol elements may be combined to form a new graphical symbol. The meaning assigned to the new graphical symbol shall be consistent with the meanings of the individual graphical symbols or graphical symbol elements used.

6 Shape

The shape of a graphical symbol should be

- simple, in order to facilitate perception and reproduction;
- readily distinguishable from those of other graphical symbols with which it may be used;
- easily associated with its intended meaning, i.e. either self-evident or easily learnt.

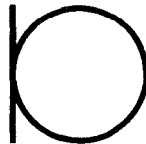
For the design of graphical symbols on safety signs, see ISO 3864.

7 Design principles

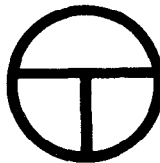
7.1 A graphical symbol shall be designed within the basic pattern (see clauses 8 and 9, and figure 3).

7.2 The shape of graphical symbols shall be such that it can be produced by the usual manufacturing methods (e.g. etching, engraving, printing and photographic means).

7.3 In general, line thicknesses shall be either 2 mm or 4 mm on the symbol originals. For visual clarity, a combination of both line thicknesses may be used. Examples are shown in figure 1.



a) Microphone (basic symbol)



b) On/off (push button)



c) Horizontal picture shift (e.g. television screen)

Figure 1 — Examples of line-thickness combinations

7.4 The minimum spacing between lines shall be chosen to take into account visual clarity and the reproduction methods to be used. As a guide, the minimum space between parallel lines should be not less than 1,5 times the minimum line thickness.

7.5 Angles smaller than 30° should be avoided.

7.6 Filled areas should be avoided.

7.7 When designing graphical symbols which incorporate arrows, the principles established in ISO 4196 shall apply.

7.8 A simple type-face should be used for constituent graphical symbol elements such as letters, numerals, punctuation marks and mathematical symbols. In the symbol original, the lettering height shall be at least 10 mm.

7.9 The use of colours should be an additional aid rather than a basic informative element for the meaning of a graphical symbol.

8 Design procedure

8.1 Procedure

Graphical symbol design should follow the following procedure :

- a) identification of a need for a graphical symbol;
- b) clear and unambiguous description of the purpose of the graphical symbol and identification of any positioning factors (see 8.2);
- c) analysis of the environmental and application factors;
- d) consideration of existing or proposed graphical symbols in the same and/or related fields;
- e) design of the graphic form as described in clause 9;
- f) testing of the graphical symbol for legibility, comprehensibility, etc.;
- g) modification, if necessary.

8.2 Orientation of the graphical symbol

The majority of graphical symbols preserve their meaning in any orientation [see figure 2a)]. However, when the meaning of a graphical symbol does depend on its orientation, this shall be explicitly stated [see figure 2b)].

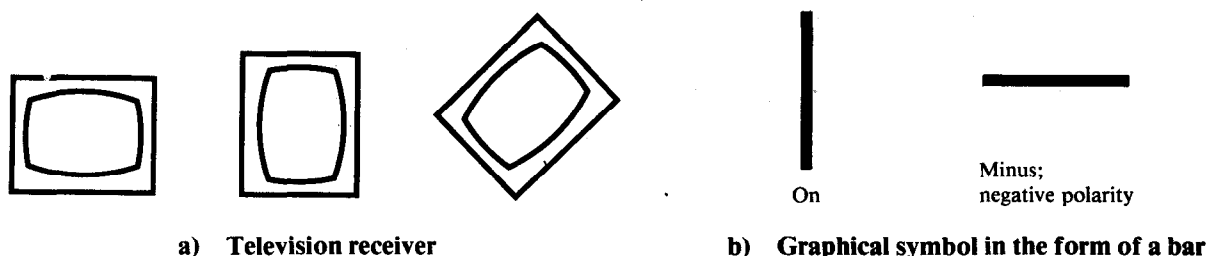
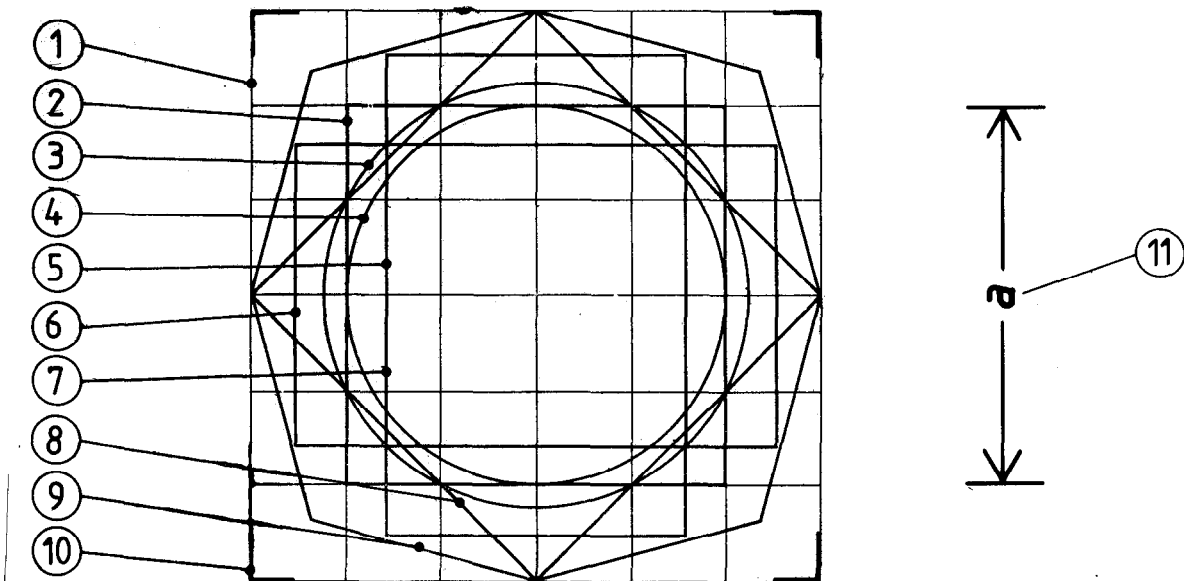


Figure 2 — Graphical symbols, the meaning of which is a) independent of orientation and b) dependent on orientation

9 Basic pattern

9.1 Structure

The basic pattern (see figure 3) should be used as a tool for the design of graphical symbols to ensure a balanced visual impression and weight. It shall be used as the basis for the design of the symbol originals (see 9.2).



Reference	Description
1	Square of 75 mm lateral length, divided into a grid of 12,5 mm line spacing.
2	Basic square of 50 mm lateral length. This dimension is equal to the nominal dimension <i>a</i> of the symbol original.
3	Basic circle of 56,6 mm diameter, having approximately the same surface area as the basic square 2.
4	Circle of 50 mm diameter, being the inscribed circle of the basic square 2.
5	Square of 40 mm lateral length which touches the basic circle 3 with its corners.
6, 7	Two rectangles having the same surface area as the basic square 2. They are mutually perpendicular, each drawn to cross symmetrically opposite sides of the basic square 2.
8	Square formed by lines joining the mid-point of the sides of square 1 and forming the largest horizontal and vertical dimensions of the basic pattern.
9	Irregular octagon formed by lines at 30° to the sides of square 8.
10	Corner markings at the outermost corners of the basic pattern (see 9.3).
11	Nominal dimension, <i>a</i> = 50 mm (see 9.3).

Figure 3 — Basic pattern

9.2 Application of the basic pattern

To achieve a visual impression of uniform size and optical weight among graphical symbols, the symbol original should be fitted into the basic pattern according to the following principles :

- for a graphical symbol consisting of a single geometrical form, such as a circle, a square or a rectangle, the corresponding geometrical forms of the basic pattern should be used;
- the lines of the graphical symbol should be centred on the lines of the basic pattern wherever possible;
- care should be taken to ensure that graphical symbols are given equal size and optical weight. For example, a circle without external parts should be drawn on basic circle 3 [see figure 4c)], whereas a circle with external parts should be drawn on circle 4 [see figure 4d)].

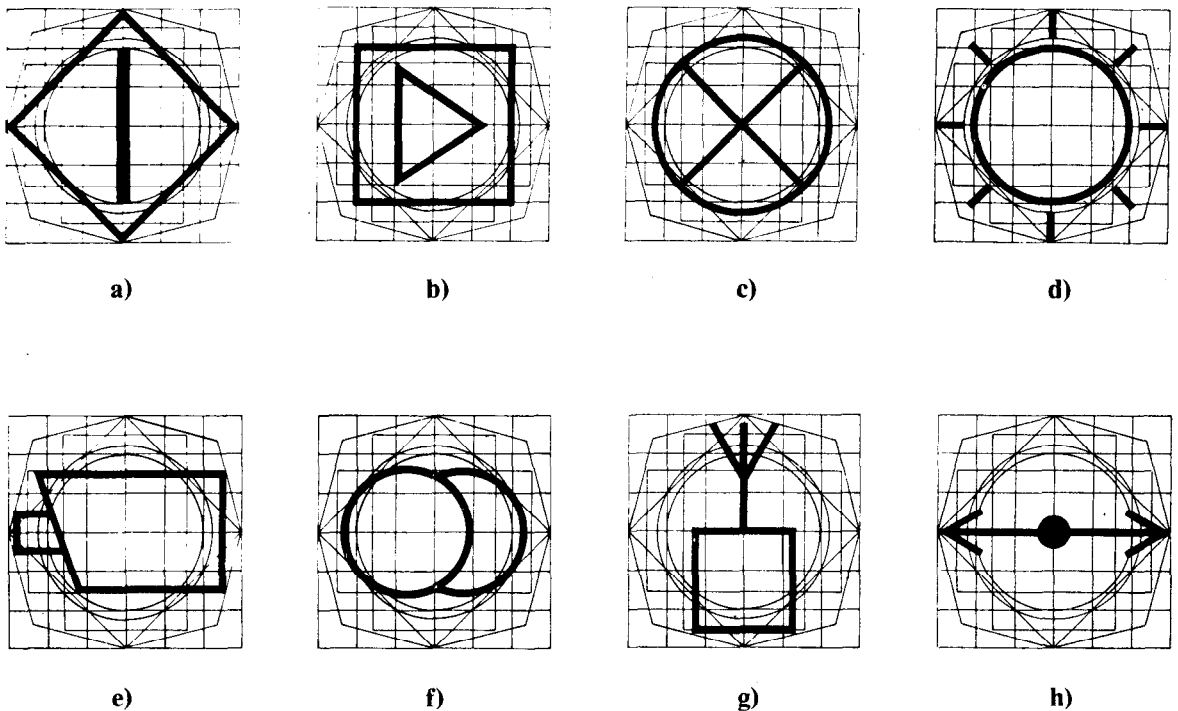


Figure 4 — Examples of application

9.3 Nominal dimension, corner markings and visual-centring lines

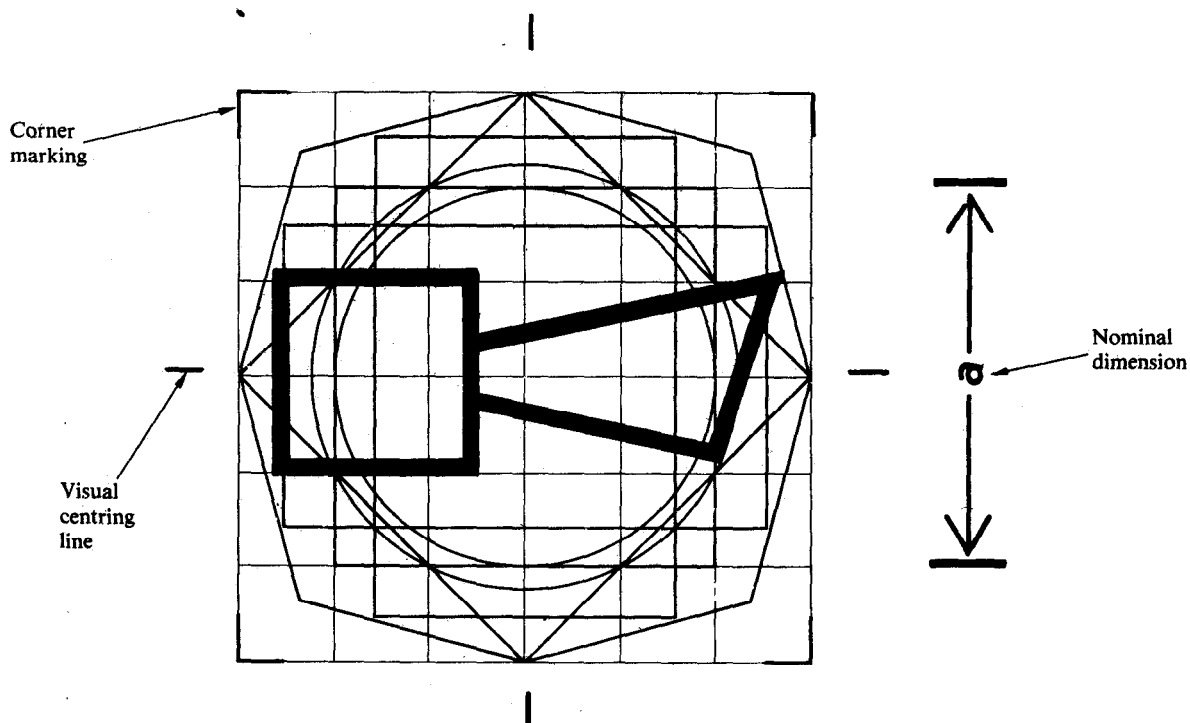


Figure 5 — Symbol original, original (master) design with corner markings, nominal dimension and visual-centring lines

9.3.1 Nominal dimension

The dimension a is the nominal dimension, equal to 50 mm for symbol originals. The real dimensions of graphical symbols often differ from the nominal dimension and are expressed as a proportional factor of a as illustrated in the following examples.

EXAMPLE 1

The real height and real width of the symbol original shown in figure 5 are 28 mm and 66,5 mm respectively which, in terms of the nominal dimension a of the symbol original, are as follows :

- real height = $0,56 a$ (i.e. $0,56 \times 50 \text{ mm} = 28 \text{ mm}$);
- real width = $1,33 a$ (i.e. $1,33 \times 50 \text{ mm} = 66,5 \text{ mm}$).

EXAMPLE 2

If it is decided that for use on equipment the graphical symbol shown in figure 5 should have a nominal dimension $a = 8 \text{ mm}$, the real dimensions of this graphical symbol will be as follows :

- real height of actual graphical symbol = $0,56 a = 0,56 \times 8 \text{ mm} = 4,48 \text{ mm}$;
- real width of actual graphical symbol = $1,33 a = 1,33 \times 8 \text{ mm} = 10,64 \text{ mm}$.

Note. — In the examples given above, the height and width of the graphical symbol were chosen as the dimensions of interest. However, the same rules are applicable whichever dimension (height, width, diameter, etc.) of the graphical symbol is chosen as the dimension of interest.

The nominal dimension serves as reference gauge for photographic reproduction of the graphical symbol. Owing to the relationship between the nominal dimension and the real dimensions of the original, the proportions of a graphical symbol will remain the same, no matter whether it is enlarged or reduced.

9.3.2 *Corner markings*

The corner markings (see figure 5) are part of the symbol original, in order to facilitate reproduction and application.

9.3.3 *Visual-centring lines*

The four visual-centring lines mark at their imaginary point of intersection the perceptual centre of the graphical symbol. This perceptual centre point is an aid for the arranging or positioning of the graphical symbol in relation to its surroundings, or for balancing the arrangement of several graphical symbols in relation to each other as well as to their surroundings, and it thus aids achievement of the final visual impression.

Note. — These visual-centring lines are required by IEC.

10 **Use of graphical symbols**

10.1 *Use of the symbol originals*

10.1.1 *IEC practice*

Graphical symbols may be copied and reduced in one process (e.g. by photographic means) directly from the symbol originals on the sheets of IEC 417. When using the appropriate graphical film, the blue grid will not copy.

10.1.2 *ISO practice*

For each graphical symbol registered in ISO 7000, the symbol original exists at the Secretariat of ISO/TC 145. Copies of all sizes and microfilm copies are available on request.

10.2 *Use of restyled symbols*

In practice, to improve the appearance and perceptibility of a graphical symbol, or to coordinate with the design of the equipment to which it is to be applied, it may be necessary to

- change the line thickness,
- round the corners,
- fill areas of the graphical symbol.

The graphic designer is normally free to make such changes provided that the essential perceptual characteristics of the graphical symbol are maintained.

10.3 *Positioning of the graphical symbol*

Care shall be taken to avoid ambiguity when using graphical symbols the meaning of which is dependent on their orientation. Such ambiguity could occur, for instance, when graphical symbols are placed on rotary knobs (see 8.2).

10.4 *Size of the actual graphical symbol*

To ensure correct recognition of an actual graphical symbol, the minimum value of its nominal dimension a , in units equivalent to those of the viewing distance, should be

$$a = \frac{L}{100}$$

where L is the viewing distance.

11 **Designation systems**

11.1 *IEC practice*

The designation system applied to each graphical symbol in IEC 417 consists of the following

- a) the number of the IEC publication;
- b) a hyphen;
- c) the three letters IEC;
- d) a hyphen;
- e) the sequential number of the graphical symbol;
- f) a hyphen;
- g) the reproduction size desired, to be expressed by the length of the nominal dimension a in millimetres (see 9.3).

EXAMPLE :

417-IEC-5115-8

11.2 *ISO practice*

The designation system applicable to each graphical symbol in ISO 7000 consists of the following

- a) the three letters ISO;
- b) a space;
- c) the number of the ISO Standard;
- d) a hyphen;
- e) the sequential registration number of the graphical symbol.

EXAMPLE :

ISO 7000-0091